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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/634,209	08/09/2000	Ting Yiu Tsui	2000.046600	4199
23720	7590	08/24/2004	EXAMINER	
WILLIAMS, MORGAN & AMERSON, P.C. 10333 RICHMOND, SUITE 1100 HOUSTON, TX 77042			PHAM, HOAI V	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 08/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/634,209

Applicant(s)

TSUI ET AL.

Examiner

Hoai v Pham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) 21-32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,5-8,11,15,16 and 20 is/are rejected.
- 7) ☒ Claim(s) 2-4,9,10,12-14 and 17-19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 1-20 in the reply filed on August 8, 2003 is acknowledged.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
4. Claims 1, 5-8, 11, 15-16, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art (fig. 1, pages 4-5) in view of Liu et al. [U.S. Pat. 6,319,821].

With respect to claims 1, 11, and 16, Applicant Admitted Prior Art discloses a method comprising:

forming a dielectric layer (120) above a copper structure (225);

forming at least one trench opening (110) and at least one upper portion of a first via opening (115) in the dielectric layer (120); and

forming a photoresist layer (150) above the at least one trench opening (110) and the at least one upper portion of the first via opening (115) in the dielectric layer (120).

Applicant Admitted Prior Art fails to disclose forming a hard mask layer above the dielectric layer and the photoresist layer with low viscosity. However, Liu et al. discloses forming a hard mask layer (64) above the dielectric layer (68) and the photoresist layer (84) with low viscosity (see fig. 7, col. 6, lines 9-10 and col. 7, lines 30-48). Therefore, it would have been obvious to one of ordinary skill in the art to form a hard mask layer above the dielectric layer as taught by Liu et al. into the process of Applicant Admitted Prior Art to serve as stress relieve layer and as a hard mask layer (see col. 6, lines 9-10). It would have been obvious to one of ordinary skill in the art to form the photoresist layer with low viscosity as taught by Liu et al. into the process of Applicant Admitted Prior Art in order to control its viscosity and density of the photoresist (see col. 5, lines 1-3).

With respect to claims 5, 15 and 20, Liu et al. also discloses that forming the dielectric layer (68) comprises forming the dielectric layer (SiO) using a low dielectric

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constant (low K) dielectric material, having a dielectric constant K of at most about four (see col. 6, lines 6-7).

With respect to claim 6, Liu et al. also discloses that forming the dielectric layer (68) comprises forming the dielectric layer using low-pressure CVD (LPCVD) (see col. 6, lines 37-38).

With respect to claims 7-8, Liu et al. also discloses that forming the hard mask layer (64) using silicon oxynitride as an antireflection coating (see col. 6, lines 9-10).

Allowable Subject Matter

5. Claims 2-4, 9-10, 12-14, and 17-19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is an examiner's statement of reasons for allowance: the prior of record fails to disclose the combination of the process steps of forming a semiconductor device recited in the base claims 1, 11 and 16, including the combination of the process steps comprising: forming a second via opening in the at least one trench opening, the second via opening extending down through the dielectric layer to the copper structure; and forming a lower portion of the first via opening in the dielectric layer, the lower portion extending down through the dielectric layer to the copper structure.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoai v Pham whose telephone number is 571-272-1715. The examiner can normally be reached on M-F.

8. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

9. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Hoai Pham', with a long horizontal flourish extending to the right.

Hoai Pham
Patent Examiner